

# Design a Crew Exploration Vehicle

## DESIGN challenge

*To design and build a Crew Exploration Vehicle (CEV) that will carry two 2 cm-sized passengers safely and will fit within a certain volume (size limitation). The CEV will be launched in the next session.*



### OBJECTIVE

*To demonstrate an understanding of the Engineering Design Process while utilizing each stage to successfully complete a team challenge.*

### PROCESS SKILLS

*Measuring, calculating, designing, evaluating*

### MATERIALS

*General building supplies*

*Digital scale*

*Mailing tube, oatmeal canister, or small coffee can (used as size constraint)*

*2 - 2 cm plastic people (i.e. Lego®)*

### STUDENT PAGES

*Design Challenge*

*Ask, Imagine and Plan*

*Experiment and Record*

*Quality Assurance Form*

*Fun with Engineering at Home*

### PRE-ACTIVITY SET-UP

*Select a size constraint (mailing tube, oatmeal canister or coffee can).*

*Fill in the sentence on the Design Challenge so students will know what the size constraint is for their CEV.*

## **MOTIVATE**

- Show the NASA BEST video titled “Repeatability”:  
<http://svs.gsfc.nasa.gov/goto?10515>
- Ask the students why it is important to test their own designs.

## **SET THE STAGE:**

## **ASKIMAGINE &PLAN**

- Share the *Design Challenge* with the students.
- Remind students to imagine a solution and draw their ideas. All drawings should be approved before building.

## **CREATE**

- Challenge students to build their CEVs based on their designs. Remind them to keep within specifications.
- Visit each team and test their designs to ensure they fit within the size specifications of the cylinder you are using.

## **EXPERIMENT**

- Each team must conduct three drop test (at 1, 2 and 3 m) and record the results.

## **IMPROVE**

- After each drop test, the students improve CEV models based on the results of the experiment.

## **CHALLENGE CLOSURE**

Engage the students with the following questions:

- What was the greatest challenge for your team today?
- Why was it important that the hatch stay closed during the drop tests?
- What process will your CEV undergo that makes it important for the astronauts to stay secured in their seats?

## PREVIEWING NEXT SESSION

Ask teams to bring back their CEV model for use in next session's challenge. You may want to store them in the classroom or have one of the facilitators be responsible for their safe return next session.

Ask teams to think about potential launch mechanisms before during the next session. Tell them they will be building a launcher out of the standard materials that have been available to them, including large rubber bands.



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Design a CEV  
**Teacher page**